CORRES. CONTROL
OUTGOING LTR NO.

DOE ORDER #

03 RF 0 1 7 4 3

DIST.	LTR	ENC
BACA, T.		
BRAILSFORD, M.D.		
BRYNER, C.J.		
CARD, R.G.		
COX, C.M.		
CRAWFORD, A.C.		
FERRERA, D.W.		
FERRI, M.S.		
FULTON, J.C.		
GIACOMINI, J.		
MARTINEZ, L.A.		
MOTES, J.L.		
RICE, K.D.		
POWERS, K.		
SCOTT, G.K.		
SHELTON, D.C.	✓	
SPEARS, M.S.		
TUOR, N.R.		
Deck, C	✓	✓
Garren, R	✓	✓
Haines, P	✓	✓
Keating, M	✓	
Knapp, S	✓	
Nesta, S	✓	✓
Putney, M	✓	✓
Lindsay, T	✓	✓
Walstrom, J	✓	
Wiemelt, K	✓	
AQM File	✓	✓
DR CONTROL	X	X
DMN RECORD		
ASTE REC CTR		
RAFFIC		
ATS/T130G		
ASSIFICATION:		
NI		
NCLASSIFIED		
ONFIDENTIAL		
ECRET		

UTHORIZED CLASSIFIER
SIGNATURE
:empt from Class ____
r CEX 072-99 ____
ite

REPLY TO RFP CC
):

:TION ITEM STATUS

PARTIAL/OPEN

CLOSED

R APPROVALS:

IG & TYPIST INITIALS
RMG / sle

sion 4/00

ORRES. CONTROL

1/9

KAISER•HILL
COMPANY

November 19, 2003

03-RF-01743

Mr. Arch Crouse
Colorado Department of Public Health and Environment
Air Pollution Control Division, SSP-B1
4300 Cherry Creek Drive South
Denver, CO 80246-1530

AIR POLLUTANT EMISSION NOTICE FOR THE 903 LIP AREA EXCAVATION PROJECT AT THE ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE (SITE) - RCN-016-03

Attached please find an Air Pollutant Emission Notice (APEN), a check for the associated APEN fees, and supporting technical documentation for the 903 Lip Area Excavation Project. An APEN is being submitted to quantify particulate emissions from the project during excavation activities.

The remedial objective for the 903 Lip Area, located directly east and south of the 903 Pad, is to remove and dispose of radionuclide-contaminated soil where actinide soil activity exceeds the respective Radioactive Soil Action Levels (RSAL). The lip area, covering approximately 35 acres, will be divided into 42' x 42' cells (grid size may vary). Soil from 6 to 18 inches in depth will be excavated, packaged and shipped to an off-site disposal facility. The decision to excavate and the depth of excavation of each cell will be determined based on radionuclide concentrations in composite soil samples. Activity levels greater than the respective sum-of-ratios RSAL will prompt excavation of the cell.

Also attached, please find a dust control plan for the project, as requested by the state.

If you have any questions concerning this correspondence or the attached information, please contact me at (303) 966-4663 or Rob Garren at (303) 966-2609, digital page (303) 212-1653.

Robert C. Nininger
Environmental Systems and Stewardship, Environmental Media Management
Kaiser-Hill Company, LLC

RMG:se

cc.
R. Birk (DOE, RFFO)
J. Legare (DOE, RFFO)

Attachments: As Stated

DEC 2003
RECEIVED
RECORDS CENTER

Kaiser-Hill Environmental Systems and Stewardship
Rocky Flats Environmental Technology Site

903 Lip Area Excavation Project
APEN Submittal Report

November 14, 2003

Introduction

This report provides supporting information to the Colorado Department of Public Health and Environment, Air Pollution Control Division (CDPHE, APCD) for submittal of an Air Pollutant Emission Notice (APEN) form quantifying particulate emissions from soil removal activities at the 903 Lip Area.

This information and the associated APEN are being transmitted to the CDPHE, APCD to meet the requirements of Colorado Air Quality Control Commission Regulation No. 3. The reportable criteria pollutants are particulates (both particulate matter less than 10 micrometers in diameter [PM10] and total particulate matter [PM]).

Background

The 903 Lip Area is located directly east and south of the 903 Pad (see attached map). The radioactive contamination of the lip area soil originated from wind/weather borne contamination transported from the 903 Pad area. The 903 Pad was used in the 1950s and 1960s for the storage of over 5,000 drums of plutonium-laden solvents and oils on the open ground. Over time, the drums corroded and leaked contamination into the soil. The drums were removed in 1967 and 1968 and an asphalt pad was installed in 1969 to cover and contain the contamination.

Sampling and characterization activities have been conducted in the 903 Lip Area to provide additional information required to determine the best course of action to remediate/manage this area. It is not anticipated that volatile organic compound (VOC) contaminated soil will be encountered during this remedial action.

Project Description

The remedial objective is to remove and dispose of radionuclide-contaminated soil from the 903 Lip Area where actinide soil activity exceeds the respective Radioactive Soil Action Levels (e.g., 50 picocuries per gram for Pu-239). Sampling data indicate that all significant radionuclide contamination is within the top 18 inches of native soil with varying levels and depths. Therefore, using mechanical excavation equipment, soil from 6 to 18 inches in depth will be excavated, packaged and shipped to an off-site disposal facility.

The soil will be removed using an excavator and loaded into shipping containers for disposal. The lip area, covering approximately 35 acres, will be divided into cells of approximately 42' x 42' in size (grid size may increase in less contaminated areas). The decision to excavate and the depth of excavation of each cell will be determined by composite soil samples. Activity levels greater than 50 picocuries per gram will prompt excavation of the cell.

APEN Submittal Information

An APEN form is provided with this report. Reportable particulate emissions will be generated during soil remediation activities. Radionuclide emissions were quantified and were below any reporting or monitoring threshold. Per the Rocky Flats Cleanup Agreement, a construction permit is not required for this type of activity.

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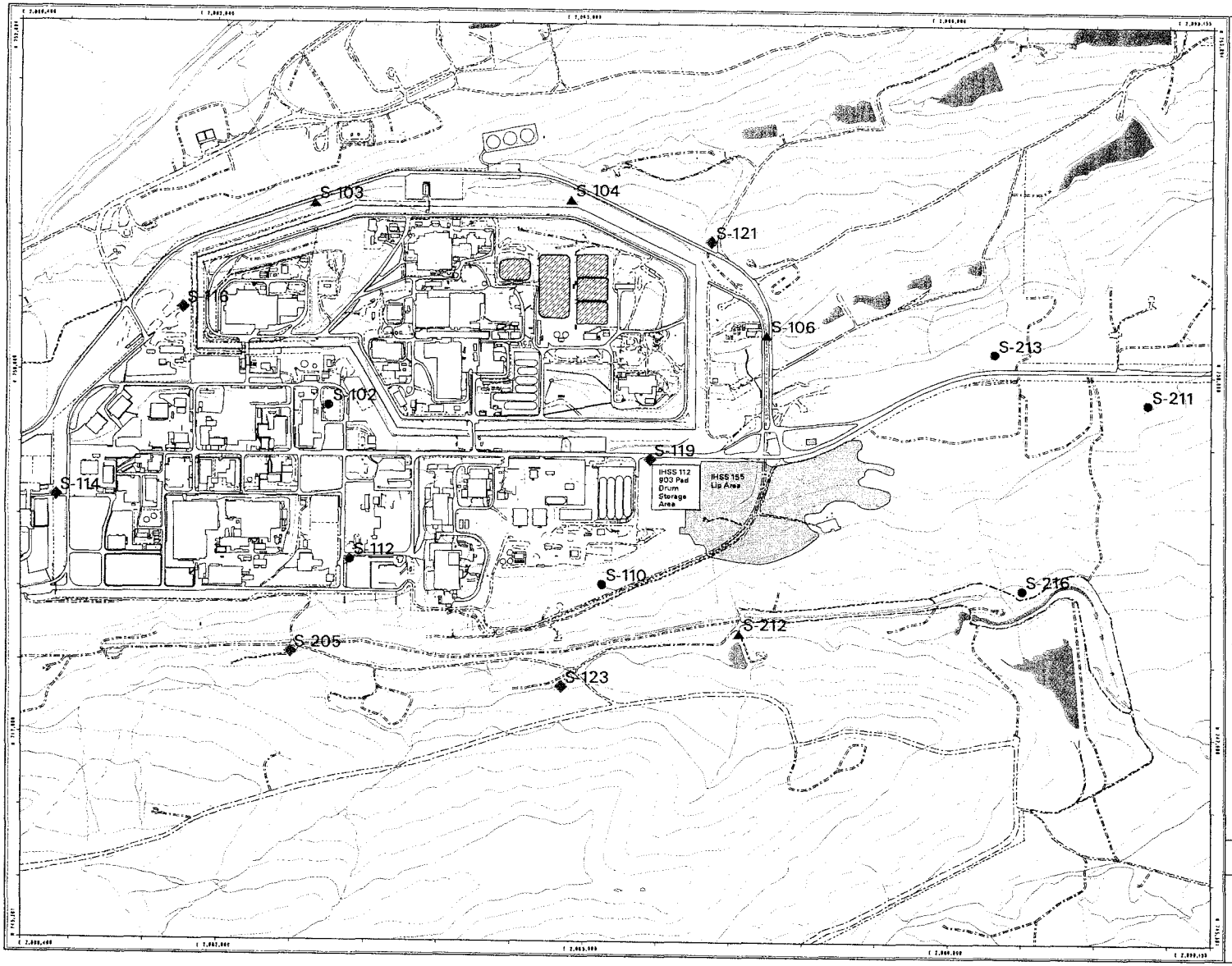
Emissions

Particulate air pollutant emissions were calculated for various soil disturbance activities utilizing emission factors from the "Compilation of Air Pollutant Emission Factors," EPA, AP-42. The reported emissions listed below are uncontrolled. No credit was taken for control methodologies (watering, dust suppression techniques, etc.).

The following table provides a summary of particulate emissions from remediation activities:

Emissions Summary Table:

	Particulate Emissions (Tons per year)	**PM-10 Emissions** (Tons per year)
Paved Road Emissions (AP-42, 13.2.1)	7.87E+00	1.54E+00
Soil Handling w/ Front end Loader (AP-42, 13.2.4, loading and unloading soil)	1.57E-02	7.44E-03
Graders for Pad Area (AP-42, Section 11.9, Table 11.9-4, scraper emission factor for top soil)	1.71E+00	1.71E+00
Excavation with Backhoe (AP-42, Section 11.9, Table 11.9-2)	1.15E-01	4.54E-02
Bulldozer for Compacting Soil (AP-42, Table 11.9.2)	3.46E-01	6.76E-02
Wind Erosion Emissions (AP-42, Section 13.2.5.3)	1.31E+01	6.55E+00
Stockpile Emissions (AP-42, Section 13.2.5.3)	1.40E-01	7.00E-02
Total Emissions:	**23.4**	**10.0**



Performance Monitoring for Radionuclides Network

Air Sampling

EXPLANATION

- 903 Pad Remediation Project (IHSS 112 & 155)
- Shared Sampler
- Industrial Area Projects
- IHSS 112
- IHSS 155

Standard Map Features

- Buildings and other structures
- Solar Evaporation Ponds (SEPs)
- Lakes and ponds
- Streams, ditches, or other drainage features
- Fences and other barriers
- Topographic Contour (20-Foot)
- Paved roads
- Dirt roads

DATA SOURCE BASE FEATURES:

Buildings, fences, hydrography, roads and other structures from 1994 aerial flyover data captured by EG&G RSL, Las Vegas. Digitized from the orthophotographs, 1995.

Topographic contours were derived from digital elevation model (DEM) data by Morrison Knudsen (MK) using ESRI Arc TIN and LATTICE to process the DEM data to create 5-foot contours. The DEM data was captured by the Remote Sensing Lab, Las Vegas, NV, 1994 Aerial Flyover at ~ 10 meter resolution. DEM post-processing performed by MK, Winter 1997.

N

Scale = 1 : 9800
1 inch represents approximately 817 feet

250 0 500 1000 ft

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

GIS Dept 303-966-7707

DRAFT

July 10, 2002

N:_Svr_w:\projects\fy2002\02-0718\perf_monitoring_rad_net.eml

AIR POLLUTANT EMISSION NOTICE

FIRM NAME U.S. Department of Energy, Rocky Flats Environmental Technology Site, and Kaiser-Hill Company, L.L.C. AIRS ID _____ PERMIT NO. _____

MAIL ADDRESS 10808 Highway 93, Unit B, Golden, Colorado 804032-8200 PLANT LOCATION Section 2, Range 70W, Township 25 COUNTY Jefferson

PERSON TO CONTACT REGARDING THIS INFORMATION Robert C. Nininger TITLE Manager, Environmental Media Management, Kaiser-Hill, L.L.C. PHONE (303) 966-4663

GENERAL DESCRIPTION OF THIS PLANT'S FUNCTION Environmental Restoration and Waste Management FEDERAL TAX I.D. NO. 84-1296851

A. GENERAL INFORMATION		Normal Operation of Plant			Process Seasonal Throughput (% of Annual)				ADDITIONAL INFORMATION OR REMARKS:
No. of Employees	Land Area	Hours/Day	Hours/Year	Days/Week	Dec-Feb	Mar-May	Jun-Aug	Sep-Nov	N/A = Not Applicable
1,848	6,521.9 acres	24	8,760	7	25	25	25	25	

B. STACK OR VENT INFORMATION (Identify below which stack if plant has two or more; refer to attached sketch of plant layout)

Height	Diameter	Temperature	Flow Rate	Velocity	Moisture	Plant ID No. for Stack
N/A	N/A ft	N/A °F	N/A ACFM	N/A ft/min	N/A %	903 Lip Area Excavation Project (soil disturbance activities)

C. FUEL INFORMATION	Design Rate (10^6 BTU/HR)	Kind of Fuel Burned	Annual Fuel Consumption		Fuel Heating Value: (BTU/lb, BTU/gal, or BTU/SCF)	Per Cent by Weight		Seasonal Fuel Use (% of Annual Use)				Space Htg (% Ann.)
Description of Combustion Unit N/A			Requested level	Data year level		Sulfur	Ash	Dec-Feb	Mar-May	Jun-Aug	Sep-Nov	
Make/Model:												
Serial No.												

D. PROCESS INFORMATION	Raw Materials Used	Raw Materials-Annual Consumption		Design Rate	Finished Product	Finished Product-Annual Output	
Description of Processing Unit N/A	Description	Requested level	Data year level	(Specify Units/Hour)	Description	Requested level	Data year level
Make/Model:							
Serial No.:							

E. POLLUTION CONTROL EQUIPMENT			Overall Collection Efficiency	ESTIMATED EMISSIONS (TONS/YEAR) AT THROUGHPUTS REQUESTED ABOVE		ACTUAL EMISSIONS (DATA YEAR)	ESTIMATION METHOD
Pollutant	Type of Control Equipment			CONTROLLED	UNCONTROLLED		
	Primary	Secondary					
Particulate	N/A	N/A	N/A	23.4	23.4	N/A	AP-42
PM_{10}	N/A	N/A	N/A	10.0	10.0	N/A	AP-42
SO_x							
NO_x							
VOC							
CO							

PLEASE USE APCD HAP ADDENDUM FORM TO REPORT HAZARDOUS AIR POLLUTANT EMISSIONS OR OTHER POLLUTANTS NOT LISTED ABOVE.

☐ **CHECK HERE IF YOU WISH THE DIVISION TO CALCULATE YOUR EMISSIONS. SEE "EMISSION ESTIMATES" INSTRUCTIONS ON BACK.**

CHECK ALL BOXES THAT APPLY

- ☒ New or previously unreported source*
- ☐ Modification of existing permit†‡
- ☐ Change in emissions, throughputs or equipment‡
- ☐ Transfer of ownership (List previous owner in REMARKS section of box A.)‡
- ☐ Relocation of Source‡
- ☐ Previous APEN is expiring‡
- ☐ Mandatory update or deferred reporting‡
- ☐ Request for Emission Reduction Credit†‡

* Complete all applicable portions of APEN
† Complete shaded areas ('Requested' values)
‡ Complete all information above box A, and those remaining portions which reflect changes

Signature of Person Legally Authorized to Supply Data:
Robert C. Nininger, Manager, Environmental Media Management, Kaiser-Hill, L.L.C. Robert C Nininger 11/17/03

Signature of Person Legally Authorized to Supply Data:
Robert H. Birk, DOE, RFFO R H Birk 11/18/03

Year for which the actual data applies: 2003

Date source began or will begin operation: November 2003

THIS NOTICE IS VALID FOR FIVE YEARS. A revised notice shall be filed prior to this expiration date, whenever a permit limitation must be modified, whenever control equipment is changed, and annually whenever a significant emission change occurs. For specific details see Regulation 3, Part A, § II.C.1.

$119.96 FILING FEE IS REQUIRED FOR EACH NOTICE FILED.

For information, call (303)692-3150.

APCD FORM 200A (9/93)

Mail to:
CDPHE, APCD
APCD-SS-B1
4300 Cherry Creek Drive South
Denver, Colorado 80246-1530

APEN # 1 OF 1

AIRS ID (APCD USE)

SITE FUGITIVE DUST CONTROL PLAN

903 Lip Area Excavation Project

Colorado Air Quality Control Commission Regulation No. 1 requires that a fugitive dust control plan be submitted by applicants whose source / activity results in fugitive dust emissions. The control plan must enable the source to minimize emissions of fugitive dust to a level that is technologically feasible and economically reasonable. If the control plan is not adequate in minimizing emissions a revised control plan may be required. The control plan (if acceptable to the CDPHE) will be used for enforcement purposes on the sources.

Please check the dust control measures which you propose for your activity.

I. Control of Unpaved Roads on Site

- [X] Watering
  - [ ] Frequent (Watering Frequency of 2 or More Times Per Day)
  - [X] As Needed
- [ ] Application of Chemical Stabilizer
- [X] Vehicle Speed Control
  Speeds limited to 15 mph maximum. Speed limit signs must be posted.
  (Generally 30 mph is maximum approvable speed on site.)
- [ ] Gravelling

II. Control of Disturbed Surface Areas on Site

- [X] Watering
  - [ ] Frequent (Watering Frequency of 2 or More Times Per Day)
  - [X] As Needed
- [ ] Application of Chemical Stabilizer
- [X] Vehicle Speed Control
  Speeds Limited To 15 MPH Maximum. Speed Limit Signs Must Be Posted.
- [X] Revegetation Revegetation Must Occur Within One Year Of Soil Disturbance
  - [X] Seeding with mulch
  - [ ] Seeding without mulch
- [ ] Furrows at right angle to prevailing wind
  Depth of furrows _____ Inches (must be greater than 6")
- [ ] Compaction Of Disturbed Soil On A Daily Basis To Within 90 % Of Maximum Compaction
  (As determined by a Proctor Test).
  - [ ] Foundation areas only; or
  - [ ] All disturbed soil.
- [ ] Wind Breaks
  Type: _____ (Example: Snow Fence, Silt Fence, etc.)
- [X] Synthetic Or Natural Cover For Steep Slopes.
  Type: MULCH + TACIFIER (Netting, Mulching, etc.)

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Page deleted contained personally identifiable information

III. Prevention Of Mud And Dirt Carried Out Onto Paved Surfaces. N/A

- ☐ Prevention
  - ☐ Gravel Entry Ways
  - ☐ Washing Vehicle Wheels
  - ☐ Other: _____
- ☐ Cleanup of Paved Areas Frequency: _____ Times Per Day
  - ☐ Street Sweeper
  - ☐ Hose With Water
  - ☐ Other: _____

Additional Sources of Emissions

List any other sources of emissions or control methods

_____

_____

_____

_____

_____

_____

Thomas M. Lindsay — 11/14/03

Signature of Legally Authorized Person — Date

Thomas M. Lindsay — Field Project Manager

Name (please print) — Title

URS

DATE 11/4/03
PROJECT NO. 903 Pad Lip
PAGE NO. 1 OF 1 BY MW

QA Completed 11/5/03 RMS

903 Pad Lip Area Remediation.

Assume 35 acres will be remediated by conventional excavation + earth moving equipment to an average depth of 8 inches. Equipment will be track hoe, front-end loader, grader, bulldozer, and haul trucks.

35 acres x 4,839.96 yd^2/acre = 169,399 yd^2 = 141,639 m^2

8 inches deep x .0278 yd/inch = 0.22 yard excavation depth

169,399 yd^2 x 0.22 yd. depth = 37,268 yd^3 soil to be excavated.

$\frac{37,268\ yd^3\ soil}{12.8\ yd^3\ soil/Truck}$ = 2,912 Truck loads.

Inner Lip Area is 12.5 acres, contaminated at: (Mean from data)
922 pCi/g Pu-239 + 162 pCi/g Am-241 (Back-up from Haines)

Outer Lip Area is 22.5 acres, contaminated at:
151 pCi/g Pu-239 + 27 pCi/g Am-241

Inner Lip $\frac{12.5\ acres}{35\ acres}$ = 35.7% of area.

Outer Lip $\frac{22.5\ acres}{35\ acres}$ = 64.3% of area.

Receptors		750'/inch			
New Home @ Indiana	14"	10,500 ft	3,200 m.	NE	3
McCaslin Blvd	17½"	13,125 ft.	4,000 m	NNE	4
96th + Indiana	13⅛"	9844 ft	3000 m	SE	1
E. of G. West Reservoir			4,686 m.	E	7
Sawmill Hwy 93	17⅝"	13,219 ft	4,029 m	WNW	5
South at Hwy 72	13⅝"	10,219 ft.	3,115 m.	S	2
Rock Flats Lake	18⅛"	13,594 ft.	4,143 m	SW	6
Mower Res.	14"	10,500 ft	3,200 m	ESE	

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903 Pad Lip Area Remediation

Assumptions:
- Remediate 35 acres of the 903 Pad Lip Area.
- The volume of soil to be excavated is 37,268 yd3.
- The volume of backfill soil is 0 yd3, brought in from off-site
- Total volume to be trucked is 37,268 yd3, or 2,912 truck loads.
- Assume paved road, trackhoe, front-end loader, scraper, and compacting emissions
- Assume inner lip soil is contaminated at 922 pCi/gram Pu-239 & 162 pCi/gram Am-241
- Assume outer lip soil is contaminated at 151 pCi/gram Pu-239 & 27 pCi/gram Am-241
- Assume total lip area will have final contamination of 50 pCi/gram Pu-239 & 8.8 pCi/gram Am-241

- soil will be hauled out through the West Gate (~2.3 mi. one way on paved roads)
- it is assumed that all roads will be paved
- Trucks will haul 12.8 yd3 per trip. Trucks are average weight of 30 tons or 27.3 Megagrams

Paved Roads (AP-42, 13.2.1)

Emission Factor Equation: EF = k*[(sL/2)^0.65]*[(W/3)^1.5], (lb/VMT)

Inputs/Assumptions:

k, particle size multiplier (AP-42, 1	0.082	TSP (<30 microns)
	0.016	PM-10 (< 10 microns)
sL, silt loading factor (g/m^2) (AP	0.736	average value for Colorado
W, average weight of vehicle (M	27.3	
n, number of vehicles =	1	
x, number of trips per vehicle =	2,912	
RT, total round trip miles travel	4.6	
VMT, vehicle miles traveled =	1.34E+04	
--> VMT=n*x*RT	-------	

* Items in regular black font are given or are used consistently site-wide and do not generally change from project to project. Items in bolded red font must be input specifically for each project. (NOTE: VMT is calculated.)

Emission Calculations:

TSP emission factor (lb/VMT) =	1.18E+00
TSP emissions (ton) =	7.87E+00
PM-10 emission factor (lb/VMT) =	2.29E-01
PM-10 emissions (ton) =	1.54E+00

Soil Handling w/Frontend Loader or Dump Truck (AP-42, 13.2.4) - loading and unloading soil

Emission Factor Equations:	EF = k*(0.0032)*[(U/5)^1.3]/[(M/2)^1.4], lb/ton		
Inputs/Assumptions:	k, particle size multiplier (AP-42, T	0.74	TSP
		0.35	PM-10
	U, average wind speed (mph) =	9	
	M, soil moisture content (%) =	10	
	d, density of soil (lb/ft^3) =	117	
	V, volume of soil handled (yd^3	37,268	
	W, weight of soil handled (ton)	5.89E+04	
	--> W=V*d*(27 ft^3/1 yd^3)*(1 to	-------	

* Items in regular black font are given or are used consistently site-wide and do not generally change from project to project. Items in bolded red font must be input specifically for each project. (Note: W is calculated.)

Emission Calculations:	TSP emission factor (lb/ton) =	5.34E-04
	TSP emissions (ton) =	1.57E-02
	PM-10 emission factor (lb/ton) =	2.53E-04
	PM-10 emissions (ton) =	7.44E-03

Graders for final grade. (AP-42, Section 11.9, Table 11.9-4, scraper emission factor for top-soil)

Emission Factor Equations:		
	TSP EF = 0.058 lb/ton of soil graded	
Inputs/Assumptions:	d, density of soil (lb/ft^3) =	117
	V, volume of soil graded (yd^3)	37268
	W, weight of soil handled (ton)	5.89E+04
	--> W=V*d*(27 ft^3/1 yd^3)*(1 to	-------

* Items in regular black font are given or are used consistently site-wide and do not generally change from project to project. Items in bolded red font must be input specifically for each project. (Note: W is calculated.)

Emission Calculations:	TSP emission factor (lb/ton) =	5.80E-02
	TSP emissions (ton) =	1.71E+00

** Assume TSP and PM-10 emission estimates are equal since a separate emission factor for PM-10 is not provided in AP-42.

Excavation w/Backhoe (AP-42, Table 11.9-2) - excavation of the site.

Emission Factor Equations:

TSP EF = [0.0021*(d)^1.1]/[(M)^0.3], lb/yd^3

PM-10 EF = 0.75*{[0.0021*(d)^0.7]/[(M)^0.3]}, lb/yd^3

Inputs/Assumptions:

d, drop height (ft) =	5
M, moisture content (%) =	10
V, volume of soil excavated (yd	37268

* Items in regular black font are given or are used consistently site-wide and do not generally change from project to project. Items in bolded red font must be input specifically for each project.

Emission Calculations:

TSP emission factor (lb/yd^3) =	6.18E-03
TSP emissions (ton) =	1.15E-01
PM-10 emission factor (lb/yd^3) =	2.44E-03
PM-10 emissions (ton) =	4.54E-02

Bulldozer (AP-42, Table 11.9-2) (Compacting Soil)

Emission Factor Equations: TSP EF = 5.7*[(s)^1.2]/[(M)^1.3], lb/hr

PM-10 EF = 0.75*[1.0*[(s)^1.5]/[(M)^1.4]], lb/hr

Inputs/Assumptions:

s, material silt content (%) =	8
M, moisture content (%) =	10
Hours of Operation per Day =	4
Days of Operation per Week =	1
Weeks of Operation per Year =	50

* Items in regular black font are given or are used consistently site-wide and do not generally change from project to project. Items in bolded red font must be input specifically for each project.

Emission Calculations:

TSP emission factor (lb/hr) =	3.46E+00
TSP emissions (ton) =	3.46E-01
PM-10 emission factor (lb/hr) =	6.76E-01
PM-10 emissions (ton) =	6.76E-02

Total Project Emissions:

Paved Roads -	7.87E+00	tpy TSP	1.54E+00	tpy PM10			
Soil Handling -	1.57E-02	tpy TSP	7.44E-03	tpy PM10	1.43E+04	grams per yr TSP	Initial Contamination Levels
Graders -	1.71E+00	tpy TSP	1.71E+00	tpy PM10	1.55E+06	grams per yr TSP	Final Contamination Levels
Backhoe -	1.15E-01	tpy TSP	4.54E-02	tpy PM10	1.04E+05	grams per yr TSP	Initial Contamination Levels
Bulldozer -	3.46E-01	tpy TSP	6.76E-02	tpy PM10	3.14E+05	grams per yr TSP	Final Contamination Levels

Total		1.01E+01	tpy TSP	3.36E+00	tpy PM10	1.98E+06	grams per yr TSP		
						1.19E+05	grams per yr TSP	Total Initial Contam. Levels	
						1.86E+06	grams per yr TSP	Total Final Contam. Levels	
Inner Lip TSP Emissions (35.7%) at initial contamination levels						4.24E+04	grams per yr TSP		
Inner Lip TSP Emissions (35.7%) at final contamination levels						6.65E+05	grams per yr TSP		
Outer Lip TSP Emissions (64.3%) at initial contamination levels						7.64E+04	grams per yr TSP		
Outer Lip TSP Emissions (64.3%) at final contamination levels						1.20E+06	grams per yr TSP		

Radionuclide Emissions Using Mean Contamination Levels From Data

	Outer Lip	Inner Lip	Inner and Outer Lip	Outer Lip Initial	Inner Lip Intitial	Final Pad	
Radionuclide	Initial pCi/gram	Initial pCi/gram	Final pCi/gram	Total Ci	Total Ci	Total Ci	Total Ci
Am-241	27	162	8.8	2.06E-06	6.87E-06	1.64E-05	2.53E-05
Pu-239	151	922	50	1.15E-05	3.91E-05	9.31E-05	1.44E-04

	Total Project Radionuclide Emissions (Ci)		**Total Project Particulate Emissions**	
	Pu-239	Am-241	TSP tons/yr	PM-10 tons/yr
Wind Fugitives	1.47E-03	2.58E-04	13.11	6.55
Wind Piles	1.07E-04	1.88E-05	0.14	0.07
Equipment Fugitives	1.44E-04	2.53E-05	10.1	3.36
Total	1.72E-03	3.02E-04	23.35	9.98

Wind Erosion of Storage Piles (Particulate and Rad) using AP-42 Chapter 13.2.5

	TSP (tn/yr)	PM10 (tn/yr)	TSP (g/yr)	Pu-239 (pCi/g)	Am-241 (pCi/g)	Pu-239 (Ci/yr)	Am-241 (Ci/yr)
Inner Lip	0.12	0.06	1.13E+05	1550	272	1.76E-04	3.08E-05
Outer Lip	0.02	0.01	1.60E+04	168	30	2.69E-06	4.79E-07
Total	**0.14**	**0.07**				1.78E-04	3.13E-05
w/ 50% controls	0.07	0.04				8.92E-05	1.57E-05

Mean	TSP (tn/yr)	PM10 (tn/yr)	TSP (g/yr)	Pu-239 (pCi/g)	Am-241 (pCi/g)	Pu-239 (Ci/yr)	Am-241 (Ci/yr)
Inner Lip	0.12	0.06	1.13E+05	922	162	1.05E-04	1.84E-05
Outer Lip	0.02	0.01	1.60E+04	151	27	2.41E-06	4.32E-07
Total	**0.14**	**0.07**				1.07E-04	1.88E-05
w/ 50% controls	0.07	0.04				5.35E-05	9.40E-06

Assumptions:

Each day's work consists of the excavation of 7 cells with a soil volume of 32 yd^3 each.
Each cell's spoils will be piled alongside the cell.
The cell spoils will be removed to a roll-off by front-loader during the day.
Therefore, each pile is created and removed each day.
No pile will be left overnight -- all excavated soils will be containerized by the end of shift.
At any given moment, it is assumed that 50% of the potential pile volume is available for wind erosion.

Pile surface calculation:

Assume conical storage piles of 32 cubic yards volume and 37 degrees base angle.
Assume one pile per cell and 7 cells per day.
Assume that 1/2 of the possible 7 cells are available at the time of the fastest-mile wind speed,
based on the work practice of moving piles to intermodals as the cells are excavated.
Volume of a cone = $\pi(r^2)(h)/3$
Area of the side of a cone = $\pi(r)(SQRT(r^2 + h^2))$
Cosine of a 37 degree base angle = 0.7986 (adjacent over hypotaneuse)
Tangent of a 37 degree base angle = 0.7535 (opposite over adjacent)

1996 on-site met data is assumed to be representative

Wind Erosion Calculations for Piles

Date	Time	10m WS (m/s)	Precip flags (1=no erosion)	u^+_{10} fastest mile (m/s)	u^* friction velocity (m/s) for 0.2 u_s/u_r area	u^* friction velocity (m/s) for 0.6 u_s/u_r area	u^* friction velocity (m/s) for 0.9 u_s/u_r area	u_t threshold friction velocity (m/s)	Erosion potential (g/m^2) for 0.2 subarea	Erosion potential (g/m^2) for 0.6 subarea	Erosion potential (g/m^2) for 0.9 subarea	Weekly 0.2 Area (m^2) assuming 3.5 piles	Weekly 0.6 Area (m^2) assuming 3.5 piles	Weekly 0.9 Area (m^2) assuming 3.5 piles	TSP emissions (g)	PM10 emissions (g)
1	15	2.53	0	3.54	0.07	0.21	0.32	1.02	0.00	0.00	0.00	53.55	63.7	16.1	0.00	0.00
End of week 1, inner lip				36.16	0.72	2.17	3.25	1.02	0.00	105.41	345.48	53.55	63.7	16.1	12276.87	6138.43
End of week 2, inner lip				22.65	0.45	1.36	2.04	1.02	0.00	15.15	85.65	53.55	63.7	16.1	2343.97	1171.98
End of week 3, inner lip				26.85	0.54	1.61	2.42	1.02	0.00	35.04	148.06	53.55	63.7	16.1	4616.08	2308.04
End of week 4, inner lip				30.04	0.60	1.80	2.70	1.02	0.00	55.09	206.57	53.55	63.7	16.1	6835.18	3417.59
End of week 5, inner lip				22.93	0.46	1.38	2.06	1.02	0.00	16.25	89.30	53.55	63.7	16.1	2472.54	1236.27
End of week 6, inner lip				25.10	0.50	1.51	2.26	1.02	0.00	25.86	120.04	53.55	63.7	16.1	3579.91	1789.95
End of week 7, inner lip				23.34	0.47	1.40	2.10	1.02	0.00	17.89	94.71	53.55	63.7	16.1	2664.78	1332.39
End of week 8, inner lip				29.90	0.60	1.79	2.69	1.02	0.00	54.12	203.80	53.55	63.7	16.1	6728.94	3364.47
End of week 9, inner lip				29.50	0.59	1.77	2.65	1.02	0.00	51.36	195.88	53.55	63.7	16.1	6425.45	3212.73
End of week 10, inner lip				26.49	0.53	1.59	2.38	1.02	0.00	33.03	141.99	53.55	63.7	16.1	4390.03	2195.01
End of week 11, inner lip				21.59	0.43	1.30	1.94	1.02	0.00	11.28	72.48	53.55	63.7	16.1	1885.23	942.61
End of week 12, inner lip				15.16	0.30	0.91	1.36	1.02	0.00	0.00	15.50	53.55	63.7	16.1	249.57	124.78
End of week 13, inner lip				14.87	0.30	0.89	1.34	1.02	0.00	0.00	13.82	53.55	63.7	16.1	222.54	111.27
End of week 14, inner lip				19.45	0.39	1.17	1.75	1.02	0.00	4.92	49.17	53.55	63.7	16.1	1104.99	552.49
End of week 15, inner lip				16.79	0.34	1.01	1.51	1.02	0.00	0.00	26.24	53.55	63.7	16.1	422.41	211.20
End of week 16, inner lip				32.14	0.64	1.93	2.89	1.02	0.00	70.60	250.29	53.55	63.7	16.1	8526.99	4263.49
End of week 17, inner lip				27.29	0.55	1.64	2.46	1.02	0.00	37.52	155.45	53.55	63.7	16.1	4892.82	2446.41
End of week 18, outer lip				17.64	0.35	1.06	1.59	1.02	0.00	1.05	32.88	53.55	63.7	16.1	595.90	297.95
End of week 19, outer lip				13.73	0.27	0.82	1.24	1.02	0.00	0.00	8.11	53.55	63.7	16.1	130.56	65.28
End of week 20, outer lip				19.18	0.38	1.15	1.73	1.02	0.00	4.26	46.58	53.55	63.7	16.1	1021.46	510.73
End of week 21, outer lip				11.38	0.23	0.68	1.02	1.02	0.00	0.00	0.11	53.55	63.7	16.1	1.78	0.89
End of week 22, outer lip				13.43	0.27	0.81	1.21	1.02	0.00	0.00	6.77	53.55	63.7	16.1	108.93	54.47
End of week 23, outer lip				18.27	0.37	1.10	1.64	1.02	0.00	2.24	38.21	53.55	63.7	16.1	758.03	379.02
End of week 24, outer lip				16.25	0.33	0.98	1.46	1.02	0.00	0.00	22.45	53.55	63.7	16.1	361.39	180.70
End of week 25, outer lip				19.52	0.39	1.17	1.76	1.02	0.00	5.10	49.87	53.55	63.7	16.1	1127.46	563.73
End of week 26, outer lip				14.35	0.29	0.86	1.29	1.02	0.00	0.00	11.06	53.55	63.7	16.1	178.11	89.06
End of week 27, outer lip				19.88	0.40	1.19	1.79	1.02	0.00	6.05	53.55	53.55	63.7	16.1	1247.61	623.80
End of week 28, outer lip				17.02	0.34	1.02	1.53	1.02	0.00	0.04	28.02	53.55	63.7	16.1	453.39	226.69

End of week 29, outer lip	18.76	0.38	1.13	1.69	1.02	0.00	3.29	42.62	53.55	63.7	16.1	895.58	447.79
End of week 30, outer lip	20.76	0.42	1.25	1.87	1.02	0.00	8.60	62.98	53.55	63.7	16.1	1561.67	780.83
End of week 31, outer lip	13.55	0.27	0.81	1.22	1.02	0.00	0.00	7.30	53.55	63.7	16.1	117.60	58.80
End of week 32, outer lip	15.64	0.31	0.94	1.41	1.02	0.00	0.00	18.39	53.55	63.7	16.1	296.09	148.05
End of week 33, outer lip	15.25	0.30	0.91	1.37	1.02	0.00	0.00	16.00	53.55	63.7	16.1	257.53	128.76
End of week 34, outer lip	14.85	0.30	0.89	1.34	1.02	0.00	0.00	13.74	53.55	63.7	16.1	221.29	110.64
End of week 35, outer lip	16.59	0.33	1.00	1.49	1.02	0.00	0.00	24.81	53.55	63.7	16.1	399.43	199.71
End of week 36, outer lip	15.06	0.30	0.90	1.36	1.02	0.00	0.00	14.93	53.55	63.7	16.1	240.42	120.21
End of week 37, outer lip	12.61	0.25	0.76	1.14	1.02	0.00	0.00	3.65	53.55	63.7	16.1	58.80	29.40
End of week 38, outer lip	16.31	0.33	0.98	1.47	1.02	0.00	0.00	22.83	53.55	63.7	16.1	367.61	183.81
End of week 39, outer lip	19.45	0.39	1.17	1.75	1.02	0.00	4.92	49.17	53.55	63.7	16.1	1104.99	552.49
End of week 40, outer lip	14.43	0.29	0.87	1.30	1.02	0.00	0.00	11.49	53.55	63.7	16.1	185.04	92.52
End of week 41, outer lip	12.53	0.25	0.75	1.13	1.02	0.00	0.00	3.37	53.55	63.7	16.1	54.18	27.09
End of week 42, outer lip	25.49	0.51	1.53	2.29	1.02	0.00	27.81	126.07	53.55	63.7	16.1	3800.90	1900.45
End of week 43, outer lip	16.91	0.34	1.01	1.52	1.02	0.00	0.00	27.17	53.55	63.7	16.1	437.48	218.74
End of week 44, inner lip	34.51	0.69	2.07	3.11	1.02	0.00	90.28	304.50	53.55	63.7	16.1	10653.55	5326.78
End of week 45, inner lip	28.92	0.58	1.74	2.60	1.02	0.00	47.57	184.95	53.55	63.7	16.1	6008.13	3004.06
End of week 46, inner lip	9.38	0.19	0.56	0.84	1.02	0.00	0.00	0.00	53.55	63.7	16.1	0.00	0.00
End of week 47, inner lip	28.48	0.57	1.71	2.56	1.02	0.00	44.71	176.63	53.55	63.7	16.1	5691.97	2845.98
End of week 48, inner lip	23.65	0.47	1.42	2.13	1.02	0.00	19.19	98.93	53.55	63.7	16.1	2815.21	1407.61
End of week 49, inner lip	28.74	0.57	1.72	2.59	1.02	0.00	46.40	181.55	53.55	63.7	16.1	5878.68	2939.34
End of week 50, inner lip	29.50	0.59	1.77	2.65	1.02	0.00	51.36	195.88	53.55	63.7	16.1	6425.45	3212.73
End of week 51, inner lip	26.56	0.53	1.59	2.39	1.02	0.00	33.41	143.15	53.55	63.7	16.1	4433.07	2216.54
End of week 52, inner lip	21.43	0.43	1.29	1.93	1.02	0.00	10.76	70.66	53.55	63.7	16.1	1822.74	911.37

Assumptions

1996 on-site met data si representative
Line 1 is an example 15-minute interval (fastest wind each week used)
AP-42 Chapter 13.2.5 Equations 1-7 used

AP-42 Chapter 13.2.5 particulate size multipliers used
AP-42 Chapter 13.2.5 Tables 13.2.5-2 and 13.2.5-3 used
AP-42 Chapter 13.2.5 Figure 13.2.5-2A used

	TSP Emissions	PM10 Emissions
Total grams	1.29E+05	6.47E+04
Total tons	0.14	0.07
Inner, grams	1.13E+05	5.67E+04
Outer, grams	1.60E+04	7.99E+03

Wind Erosion Emissions (Particulate and Rad) using AP-42 Chapter 13.2.5

95% UCL Pu-239 Conc.	TSP (tn/yr)	PM10 (tn/yr)	TSP (g/yr)	Pu-239 (pCi/g)	Am-241 (pCi/g)	Pu-239 (Ci/yr)	Am-241 (Ci/yr)
Inner Lip	2.19	1.09	1.98E+06	1550	272	1.59E-03	2.78E-04
Outer Lip	0.14	0.07	1.30E+05	168	30	1.42E-05	2.52E-06
Final Contour	10.78	5.38	9.78E+06	50	8.8	4.89E-04	8.61E-05
Total	13.11	6.55				2.09E-03	3.67E-04
w/ 50% controls	6.55	3.27				1.04E-03	1.83E-04

Mean Pu-239 Conc.	TSP (tn/yr)	PM10 (tn/yr)	TSP (g/yr)	Pu-239 (pCi/g)	Am-241 (pCi/g)	Pu-239 (Ci/yr)	Am-241 (Ci/yr)
Inner Lip	2.19	1.09	1.98E+06	922	162	9.64E-04	1.69E-04
Outer Lip	0.14	0.07	1.30E+05	151	27	1.31E-05	2.33E-06
Final Contour	10.78	5.38	9.78E+06	50	8.8	4.89E-04	8.61E-05
Total	13.11	6.55				1.47E-03	2.58E-04
w/ 50% controls	6.55	3.27				7.33E-04	1.29E-04

Assumptions:

No erosion occurs during any 15-minute period with measureable precipitation or while soil is drying, based on AME algorithm (FY01 report)
The surface roughness is reasonably well characterized by the "overburden" friction velocity (1.02) provided by AP-42 (Table 13.2.5-2)
AP-42 algorithms for estimating particulate emissions due to wind erosion are approporiate (Chapter 13.2.5, equations 1-4)
Fastest-mile wind speed = 15-minute average wind speed X 1.4 (direct communication with Chatten Cowherd, AP-42 chapter author)
Inner lip area = 12.5 acres/6 mo X 4046.825 m2/acre X 1 mo/22 work days = ~383 m2/day = ~1946 m2/week
Outer lip area = 22.5 acres/6 mo X 4046.825 m2/acre X 1 mo/22 work days = ~690 m2/day = ~3502 m2/week
Each area is disturbed 3 times: first by excavation, then (same week) by grading/contouring, then (1 week later) by recontouring
First disturbance is contaminated at untreated level; grading/contouring and recontouring disturbances have RSAL-level contamination
Am-241 specific activity = [(Pu239 activity)/5.7] based on historic 903 Pad soil data
Pu239 specific activity taken from ER soil characterization spreadsheet

Wind Erosion Calculations for Lip Area
Disturbances 1 & 2

Date	Time	10m WS (m/s)	Precip flags (1=no erosion)	u^*_{10} fastest mile (m/s)	u^* (friction velocity) (m/s)	u_t (threshold friction velocity) (m/s)	Erosion potential (g/m^2) (weekly)	Area disturbed (m^2)	TSP emissions (g)	PM10 emissions (g)
1	15	2.53	0	3.54	0.19	1.02	0.00	3892	0.00	0.00
End of week 1, inner lip				36.16	1.92	1.02	69.04	3892	268699.42	134349.71
End of week 2, inner lip				22.65	1.20	1.02	6.40	3892	24927.20	12463.60
End of week 3, inner lip				26.85	1.42	1.02	19.51	3892	75917.03	37958.51
End of week 4, inner lip				30.04	1.59	1.02	33.31	3892	129630.87	64815.44
End of week 5, inner lip				22.93	1.22	1.02	7.10	3892	27630.54	13815.27
End of week 6, inner lip				25.10	1.33	1.02	13.35	3892	51952.59	25976.30
End of week 7, inner lip				23.34	1.24	1.02	8.15	3892	31726.99	15863.50
End of week 8, inner lip				29.90	1.58	1.02	32.63	3892	127004.07	63502.03
End of week 9, inner lip				29.50	1.56	1.02	30.71	3892	119526.89	59763.45
End of week 10, inner lip				26.49	1.40	1.02	18.14	3892	70612.52	35306.26
End of week 11, inner lip				21.59	1.14	1.02	4.00	3892	15561.26	7780.63
End of week 12, inner lip				15.16	0.80	1.02	0.00	3892	0.00	0.00
End of week 13, inner lip				14.87	0.79	1.02	0.00	3892	0.00	0.00
End of week 14, inner lip				19.45	1.03	1.02	0.27	3892	1060.62	530.31
End of week 15, inner lip				16.79	0.89	1.02	0.00	3892	0.00	0.00
End of week 16, inner lip				32.14	1.70	1.02	44.20	3892	172015.73	86007.86
End of week 17, inner lip				27.29	1.45	1.02	21.19	3892	82461.23	41230.62
End of week 18, outer lip				17.64	0.93	1.02	0.00	7004	0.00	0.00
End of week 19, outer lip				13.73	0.73	1.02	0.00	7004	0.00	0.00
End of week 20, outer lip				19.18	1.02	1.02	0.00	7004	0.00	0.00
End of week 21, outer lip				11.38	0.60	1.02	0.00	7004	0.00	0.00
End of week 22, outer lip				13.43	0.71	1.02	0.00	7004	0.00	0.00
End of week 23, outer lip				18.27	0.97	1.02	0.00	7004	0.00	0.00
End of week 24, outer lip				16.25	0.86	1.02	0.00	7004	0.00	0.00
End of week 25, outer lip				19.52	1.03	1.02	0.37	7004	2595.96	1297.98
End of week 26, outer lip				14.35	0.76	1.02	0.00	7004	0.00	0.00
End of week 27, outer lip				19.88	1.05	1.02	0.91	7004	6350.08	3175.04
End of week 28, outer lip				17.02	0.90	1.02	0.00	7004	0.00	0.00
End of week 29, outer lip				18.76	0.99	1.02	0.00	7004	0.00	0.00
End of week 30, outer lip				20.76	1.10	1.02	2.38	7004	16700.62	8350.31
End of week 31, outer lip				13.55	0.72	1.02	0.00	7004	0.00	0.00
End of week 32, outer lip				15.64	0.83	1.02	0.00	7004	0.00	0.00
End of week 33, outer lip				15.25	0.81	1.02	0.00	7004	0.00	0.00
End of week 34, outer lip				14.85	0.79	1.02	0.00	7004	0.00	0.00
End of week 35, outer lip				16.59	0.88	1.02	0.00	7004	0.00	0.00
End of week 36, outer lip				15.06	0.80	1.02	0.00	7004	0.00	0.00
End of week 37, outer lip				12.61	0.67	1.02	0.00	7004	0.00	0.00
End of week 38, outer lip				16.31	0.86	1.02	0.00	7004	0.00	0.00
End of week 39, outer lip				19.45	1.03	1.02	0.27	7004	1908.69	954.34
End of week 40, outer lip				14.43	0.77	1.02	0.00	7004	0.00	0.00
End of week 41, outer lip				12.53	0.66	1.02	0.00	7004	0.00	0.00
End of week 42, outer lip				25.49	1.35	1.02	14.64	7004	102546.11	51273.06
End of week 43, outer lip				16.91	0.90	1.02	0.00	7004	0.00	0.00
End of week 44, inner lip				34.51	1.83	1.02	58.19	3892	226469.50	113234.75
End of week 45, inner lip				28.92	1.53	1.02	28.09	3892	109312.41	54656.20
End of week 46, inner lip				9.38	0.50	1.02	0.00	3892	0.00	0.00
End of week 47, inner lip				28.48	1.51	1.02	26.11	3892	101630.45	50815.22
End of week 48, inner lip				23.65	1.25	1.02	8.99	3892	34974.09	17487.04
End of week 49, inner lip				28.74	1.52	1.02	27.28	3892	106160.91	53080.46
End of week 50, inner lip				29.50	1.56	1.02	30.71	3892	119526.89	59763.45
End of week 51, inner lip				26.56	1.41	1.02	18.40	3892	71619.57	35809.78
End of week 52, inner lip				21.43	1.14	1.02	3.68	3892	14324.60	7162.30

	TSP Emissions	PM10 Emissions
Total grams	2.10E+06	1.05E+06
Total tons	2.31	1.16
Inner Lip, g	1.98E+06	9.91E+05
Outer Lip, g	1.30E+05	6.51E+04

Assumptions:

1996 on-site met data is representative
Line 1 is an example 15-minute interval (fastest wind each week used)
AP-42 Chap. 13.2.5, Equations 1-4 used
Ap-42 Chap. 13.2.5 particle size multipliers used
According to AP-42, erosion occurs only when $u^* > u_t$ (columns F & G)

Wind Erosion Calculations for Lip Area Disturbance 3 (Final Contour)

Date	Time	10m WS (m/s)	Precip flags (1=no erosion)	u^+_{10} fastest mile (m/s)	u^* (friction velocity) (m/s)	u_t (threshold friction velocity) (m/s)	Erosion potential (g/m^2) (weekly)	Area disturbed (m^2)	TSP emissions (g)	PM10 emissions (g)
1	15	2.53	0	3.54	0.19	1.02	0.00	1.42E+05	0.00	0.00
Max Fastest Mile, 1996				36.16	1.92	1.02	69.04	1.416E+05	9.779E+06	4.889E+06

	TSP Emissions	PM10 Emissions
Total tons	10.78	5.38
grams	9.78E+06	4.89E+06

Assumptions:
1996 on-site met data is representative
Line 1 is an example 15-minute interval (fastest wind for year used)
AP-42 Chap. 13.2.5, Equations 1-4 used
AP-42 Chap. 13.2.5 particle size multipliers used
According to AP-42, erosion occurs only when $u^* > u^t$ (columns F & G)